MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PPC0116 – PRE-CALCULUS
(All Sections / Groups)

31ST MAY 2017
2:30 p.m – 4:30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages with 4 Questions only.

2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the Answer Booklet provided.

Question 1

(a) Solve the equation:

$$\frac{3x}{x+2} + \frac{1}{x-1} = \frac{4-7x}{x^2+x-2}$$

[5 marks]

(b) Write each of the following complex numbers in standard form $a+bi$:

(i) $\dfrac{1+4i}{5-12i}$

[3 marks]

(ii) $i^{33}\left(3+5i^{51}\right)$

[3 marks]

(c) Find the real solution of the equation $\sqrt{3x-2}-2x=-8$.

[5 marks]

(d) Solve the inequality below:

$$1 \le \frac{2x+5}{6} < \frac{5}{4}.$$

Express your answer using interval notation.

[4 marks]

(e) Solve the inequality below:

$$1 - \left|\frac{2x-1}{3}\right| < -2$$

Express your answer using set notation or interval notation. Then graph the solution set.

[5 marks]

Continued...

Question 2

(a) Determine the center and radius of the graph whose equation is

$(x + 3)^2 + (y - 2)^2 = 16$.

[5 marks]

(b) $f(x) = (x + 4)(x - 1)^2 (x - 2)$

(i) Determine the end behaviour of the graph. Justify your answer.

[3 marks]

(ii) Find the x-intercept(s) and y- intercept(s), if any.

[4 marks]

(iii) State whether the graph crosses or touches the x-axis at each of the x-intercepts. Justify your answer.

[3 marks]

(iv) Determine the maximum number of turning points on the graph.

[2 marks]

(v) Hence, sketch the graph of $f(x)$.

[4 marks]

(c) Rewrite the expression below as a single logarithm:

$$2 \log_a(5x^3) - \left(\frac{1}{2}\right) \log_a(2x + 3)$$

[4 marks]

Continued...

Question 3

(a) Use long division to show that $f(x) = \dfrac{x^3 + 4x^2 + 3x + 4}{x^2 + 3}$ can be written as

$f(x) = x + 4 - \dfrac{8}{x^2 + 3}$.

[6 marks]

(b) Using synthetic division, find a, b, c, and d for the equation below:

$$\frac{x^3 - 2x^2 + 3x + 5}{x + 2} = ax^2 + bx + c + \frac{d}{x + 2}$$

[5 marks]

(c) (i) State the Remainder Theorem.

[2 marks]

(ii) What is the remainder when $f(x) = 2x^{20} - 8x^{10} + x - 2$ is divided by $x - 1$?

[2 marks]

(d) Find the partial fraction decomposition of $\dfrac{x^2 + 2x + 7}{(x-3)(x^2 + 2)}$.

[10 marks]

Continued...

Question 4

(a) A pond currently has 2000 trout (a species of freshwater fish) in it. The fish hatchery's owner decides to add an additional 20 trout each month. In addition, it is known that the trout population is growing 3% per month. The size of the population after n months is given by the recursively defined sequence

$$p_0 = 2000 \qquad p_n = 1.03p_{n-1} + 20$$

How many trout are there in the pond after two months? That is, what is p_2?

[4 marks]

(b) The fifth term of an arithmetic sequence is 11 and the tenth term is 41.
    (i)   Find the first term and the common difference.

[3 marks]

    (ii)   Determine the explicit/general formula for the sequence and find the 20th term of the sequence.

[3 marks]

    (iii)   Find the summation of the first 8 terms of this sequence.

[4 marks]

(c) Find the 8th term of the geometric series below:
$$1, 3, 9, \dots$$

[2 marks]

(d) Find x so that x, $x + 2$ and $x + 3$ are consecutive terms of a geometric sequence.

[4 marks]

(e) Show that $\binom{n}{n-1} = n$ and $\binom{n}{n} = 1$.

[5 marks]

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